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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/584,340	08/02/2006	Tadahiro Ohmi	039262-0153	2005

22428 7590 12/01/2009

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EXAMINER	
CHEN, KEATH T	

ART UNIT	PAPER NUMBER
1792	

MAIL DATE	DELIVERY MODE
12/01/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/584,340	OHMI ET AL.	
	Examiner	Art Unit	
	KEATH T. CHEN	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 October 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *9-22,28,29,32,33 and 35* is/are pending in the application.

4a) Of the above claim(s) *15-17,19-22,28,29 and 32* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *9-14,18,33 and 35* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *11/06/2009*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 10/13/2009 has been entered.

Response to Amendment

1. The claim amendment filed on 10/13/2009, addressing claim 9-14, 18, and 33-35 rejections from the final office action (01/14/2009), by amending claims 9 and 12 and cancelling claim 34 is acknowledged and will be addressed below.

Election/Restrictions

2. Claims 15-17, 19-22, 28-29, and 32 remain withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected Group II and Species b-e, there being no allowable generic or linking claim.

Claim Interpretation

Applicant's claim requirement "each of the plurality of ejection holes ... twice or less a plasma sheath thickness ..." of claims 9 and 12 is considered intended use in the pending apparatus claims because the sheath thickness depends on operating parameters. Further, it has been held that claim language that simply specifies an intended use or field of use for the invention generally will not limit the scope of a claim

(*Walter*, 618 F.2d at 769, 205 USPQ at 409; MPEP 2106). Additionally, in apparatus claims, intended use must result in a structural difference between the claimed invention and the prior art in order to patentably distinguish the claimed invention from the prior art. If the prior art structure is capable of performing the intended use, then it meets the claim (*In re Casey*, 152 USPQ 235 (CCPA 1967); In re Otto, 136 USPQ 458, 459 (CCPA 1963); MPEP2111.02). When the structure recited in the reference is substantially identical to that of the claims, claimed properties or functions are presumed to be inherent (*In re Best*, 562 F.2d 1252, 1255, 195 USPQ 430, 433 (CCPA 1977); MPEP 2112.01).

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 9-10 and 12 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The newly added limitations of claim 9 "ejection hole ... is twice or less a plasma sheath thickness" while in the Specification, clearly a low bound is required (0.02 mm,

for example, page 10, line 13). The size smaller than 0.02 mm is not supported by the original Specification.

4. Claims 9-10 and 33 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The newly added limitations of claims 9 and 12:

> each of the plurality of ejection holes is configured in such a way that a diameter of the ejection hole, on the side where the gas flows out of the hole, is twice or less a plasma sheath thickness (d),
>
> $$d = 1.307 \times \lambda_D \left[\frac{1}{2} \left\{ 1 + \ln\left(\frac{m_i}{2\pi m_e} \right) \right\} \right]^{\frac{3}{4}}$$, wherein m_i and m_e represent a plasma ion mass and an electron mass, respectively, and
>
> $$\lambda_D = \sqrt{\frac{\varepsilon_0 k T_e}{n_e e^2}}$$, wherein ϵ_0 represents a permittivity of free space, k a Boltzmann's constant, T_e an electron temperature, n_e a plasma electron density, and e a unit charge.

is dependent on the operating parameters such as mass of the ionic species of the plasma and the plasma electron density, also admitted by the Applicants "depending on the plasma sheath thickness, it may be not more than 10 mm" (Specification, page 11, lines 2-3). Therefore, the metes and bounds of the claim limitation of the apparatus is not clear.

Claim 9 will be examined as inclusive of 10 mm or less, and may be more.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

5. Claims 9-14, 18, 33, and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Herchen et al. (US 5819434, hereafter '434), in view of Nguyen (US 6565661, hereafter '661).

'434 teaches some limitations of:

Claim 9: A shower plate (Fig. 4, col. 4, lines 52-59) having a plurality of ejection holes (#26s and #28s) adapted to eject a gas, wherein the plurality of rejection holes increases in diameter as going outward of the shower plate (circumferential apertures #28 larger than central aperture #26).

'434 further teaches that the actually arrangement of apertures in considered to be a matter of choice and may be arrived at independently of the section profile imparted (col. 4, lines 57-59). '434 is silent on the diameter of the aperture.

'434 does not explicitly teaches the limitations of:

Claim 9: each of the plurality of rejection holes increases in diameter as going outward of the shower plate (and the newly added limitation).

'661 is an analogous art in the field of semiconductor manufacturing (abstract) using plasma (col. 5, lines 35-37; similar to '434, see technical field), particularly in showerhead (field of the invention; similar to '434, technical field). '661 teaches a

showerhead with a diameter of the ejection hole is changed from the side (#19, Fig. 4) where the gas flows into the hole toward the side (#18) where the gas flows out of the hole (col. 6, lines 34-39) and the diameter on the side where the gas flows out of the hole is not less than 0.02 mm and is not more than 10 mm (0.2~2 mm, col. 6, lines 34-35).

At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to have arranged apertures each increasing in diameter as going outward of the shower plate in Fig. 4 of '434, for the motivation to fit a particularly section profile (col. 4, lines 57-59) to promote even distribution of process gas (col. 3, lines 15-18); and to have adopted the showerhead hole design of in Fig. 4 of '661 to the apparatus in Fig. 4 of '434, for the purpose/motivation of providing a high flow conductance showerhead, as taught by '661 (col. 3, line 1) to achieve uniform distribution of precursor (col. 2, lines 65-67). Note the diameter range of '661 falls within Applicants requirement (10 mm, Specification, page 11, lines 2-3).

'434 does not teach the limitations of:

Claim 10: A shower plate according to claim 9, wherein a diameter of the ejection hole is changed from the side (#19) where the gas flows into the hole toward the side (#18) where the gas flows out of the hole (col. 6, lines 34-39).

Claim 11: A shower plate according to claim 10, wherein the diameter on the side where the gas flows out of the hole is not less than 0.02 mm and is not more than 10 mm (0.2~2 mm, col. 6, lines 34-35).

The above combinations, together, teach some limitations of:

Claim 12: A shower plate ('661, Fig. 4) having a plurality of ejection holes (#18, col. 6, line 26) adapted to eject a gas (precursor, col. 6, lines 39-54), wherein each ejection hole has a portion, on the side (#19) where the gas flows into the hole, having a width which is more than 0.5 mm and is not more than 5 mm (2~15 mm, col. 6, lines 37-38) and a portion, on the side (#18) where the gas flows out of the hole, having a width which is not less than 0.02 mm and is not more than 0.5 mm (0.2~2 mm, col. 6, lines 34-35), wherein each of the plurality of rejection holes increases in diameter as going outward of the shower plate ('434 teaches, as discussed above, from arranging particular section profile).

Claim 13: A shower plate according to claim 12, wherein said portion (#18) having the width which is not less than 0.02 mm and is not more than 0.5 mm has a length of 0.2 mm to 2 mm (0.5~5 mm, col. 6, line 35).

Claim 14: A shower plate according to claim 13, wherein said shower plate has a thickness of at least 20 mm (T*, col. 6, lines 55-60, being larger than T 3~20 mm, col. 6, line 28).

'434 and '661, together, do not explicitly teach the limitation of the exact ranges:

Claim 12: on the side (#19) where the gas flows into the hole, having a width which is more than 0.5 mm and is not more than 5 mm and on the side (#18) where the gas flows out of the hole, having a width which is not less than 0.02 mm and is not more than 0.5 mm.

Claim 13: a length of 0.2 mm to 2 mm.

Claim 14: a thickness of at least 20 mm.

'661 discloses the claimed invention except for the range of size of the holes and the thickness of shower plate overlap the claimed invention. "In the case where the claimed ranges 'overlap or lie inside ranges disclosed by the prior art' a prima facie case of obviousness exists." See MPEP 2144.05 I.

'434 further teach the limitations of:

Claim 18: A shower plate according to claim 12, wherein the peripheral portion of the surface of said shower plate on the side where the gas flows out is projected over the center portion thereof (as shown in Fig. 3, col. 4, lines 19-28).

For claims 33 and 35, '434 further teaches aperture size is an effect parameter: "that the actually arrangement of apertures in considered to be a matter of choice and may be arrived at independently of the section profile imparted" (col. 4, lines 57-59).

Claims 33 and 35: A shower plate according to claim 9 (or 12), wherein the diameter of said plurality of ejection holes increase in the range of 0.1 to 0.11 mm as going outward of the shower plate.

'434 and '661, together, disclose the claimed invention except for specific diameter size range. It would have been obvious to a person having ordinary skill in the art at the time the invention was made to optimize the hole diameter size range, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Response to Arguments

Applicant's arguments filed 10/13/2009 have been fully considered but they are not persuasive.

6. Applicants' arguments with respect to the newly added limitation of 9 and 12 have been considered but are unconvincing because a) the plasma sheath thickness depends on the operating condition; and b) the range of the aperture diameter of '661 is within the range cited by the Applicants.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KEATH T. CHEN whose telephone number is (571)270-1870. The examiner can normally be reached on 6:30AM-3 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on 571-272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/K. T. C./
Examiner, Art Unit 1792

/Michael Cleveland/
Supervisory Patent Examiner, Art Unit 1792